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(71) Applicant

Crown Wallcoverings Ltd

(Incorporated in the United Kingdom)

Belgrave Road, Darwen, BB3 2RR, United Kingdom

(72) Inventor

Sydney Puleston

(74) Agent and/or Address for Service

Frank B Dehn

Imperial House, 15-19 Kingsway, London, WC2B 6UZ,
United Kingdom

(54) Engraved printing rolls

(57) An engraved printing roll is made by applying a cell forming tool (20) to the roll surface in a manner such that sequential diamond-shaped indentations caused by the tool partially overlap (typically by 20% of cell dimension) taken in the direction of the circumference of the roll. Sharply defined weirs (15) are thereby created for flow between cells in said direction.

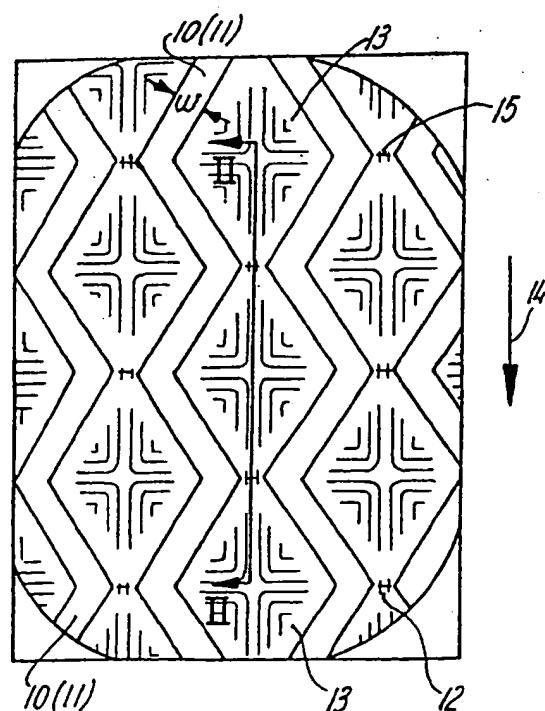


FIG. 1

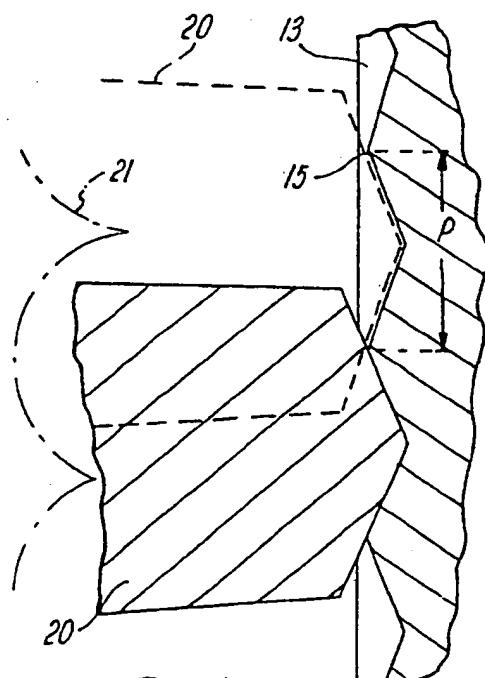
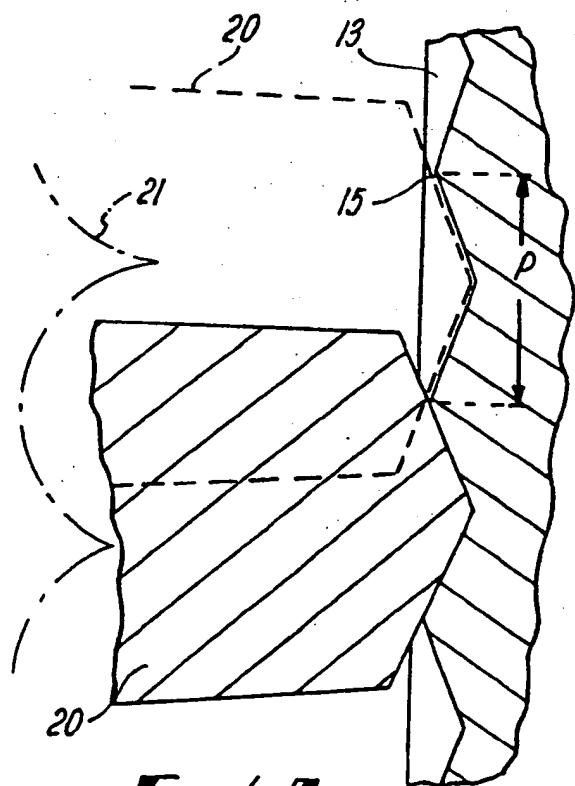
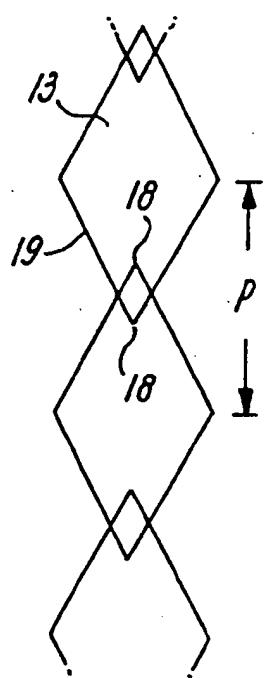
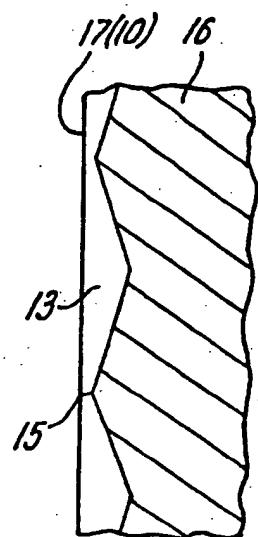
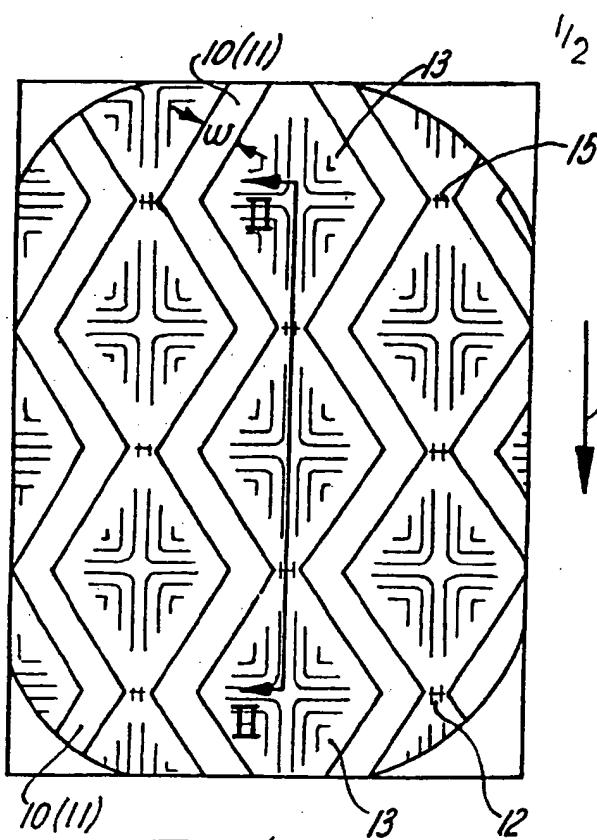


FIG. 4

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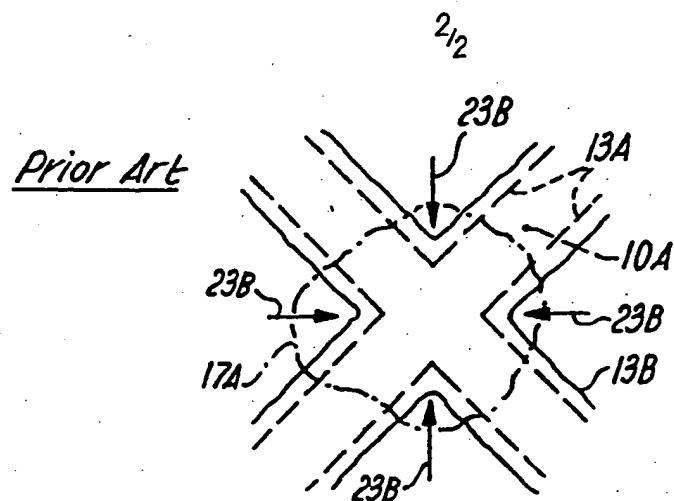


FIG. 5A

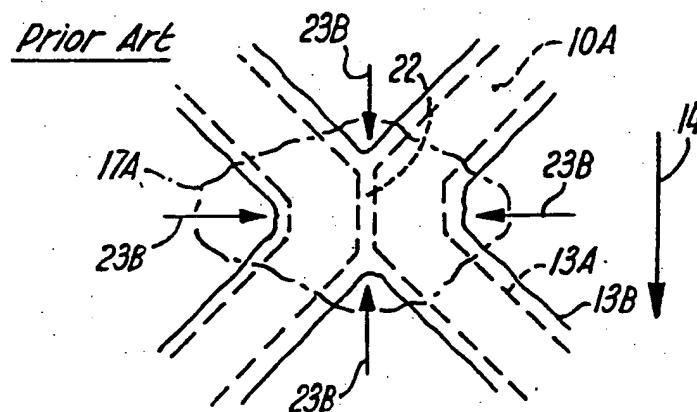


FIG. 5B

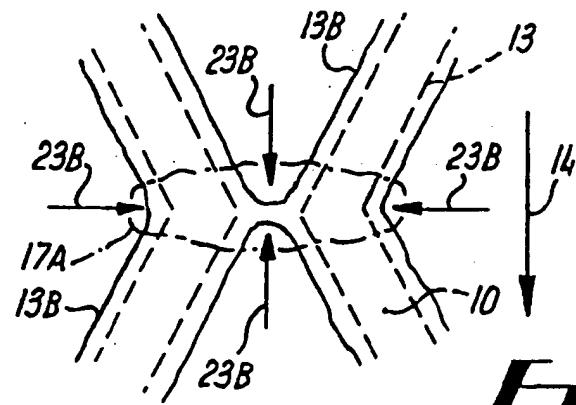


FIG. 6

Title : Engraved Printing Rolls

This invention relates to printing rolls which are mechanically engraved to produce cell apertures on the roll surface.

The earliest form of engraved roll had a pattern of circular shaped cells. This produced a substantial "corner post" between the cells. Subsequent to this, square shaped and hexagon shaped cells were developed. This served to reduce the corner post. Another development included tri-helical grooving. This reduced "corner post" problems but suffered the side effect of causing lateral ink migration with less control over coating application.

So called "electronic engraving" (where a detector "reads" a black and white print of a design pattern to control a cutting stylus) can be programmed so that the stylus drags between one cell and the next to create a relatively shallow interconnecting channel and this aids the flow of ink. There is also known (see USP 4,301,583) a mechanical engraving process in which a shallow V-cut channel exists between adjacent cells and (see USP 3,613,478) engraving involving wide and narrow lands to present interconnecting channels.

It is an object of the present invention to provide a new mechanical engraving process which provides printing rolls which have an extended print life when maintaining a given quality of printing.

In accordance with the present invention a process of mechanically engraving a printing roll comprises the step of applying a forming tool to the roll surface in a manner such that sequential diamond-shaped indentations caused by the tool partially overlap in the direction of the circumference of the roll.

The preferred shape of the cells on the tool is that providing an elongated rhombus shape, that is, the axis of the rhombus measured in the direction of the circumference of the roll is larger than the other axis.

The cells formed may be of whole or truncated pyramid form.

The invention also provides a mechanically engraved roll having cells interconnected, in the direction of the circumference of the roll, at sharply defined weirs.

The invention will now be described further with reference to the accompanying drawings in which:

Fig. 1 is a portion of a microphotograph of the engraved surface of a roll, in accordance with the invention,

Fig. 2 is a section of the line II - II of Fig. 1;

Fig. 3 is an explanatory diagram showing the formation of a master die;

Fig. 4 is a sectional elevation supplementing Fig. 3;

Figs. 5A and 5B show a portion of the surfaces of two prior art forms of roll and the effect of use; and

Fig. 6 shows a portion of the surface shown in Fig. 1 and the effect of use.

In Fig. 1 the cell wall areas (10) are zig-zags (11) of constant width (w). Any two adjacent zig-zags are 5 mirror images of each other but they do not touch so that an opening (12) exists between cells (13) taken in the direction (14) of the circumference of the roll surface. The cells (13) are elongate diamond pyramidal in shape and form. They could also have a quadrilateral base. A form 10 of sharply-defined weir (15) exists between adjacent cells at the opening (12).

In Fig. 2 a fraction of a roll (16) is shown in section having at its surface the cells (13). The surface (17) of the roll (which is swept by a doctor blade in use) 15 is shown and this, of course, defines the cell wall areas (10). The weirs (15) are also shown.

In Figs 3 and 4 the pyramidal indentation making up each cell (13) is shown as an elongate diamond shape (19). As each indentation overlaps its adjacent indentations a 20 form of chain is created. Of course, the leading and trailing points (18) of the indentations become obliterated as each succeeding indentation is made and the eventual outline of the cells - i.e. the diamond shaped cell aperture (13) is as shown in Fig. 1. Indentations 25 in the roll are made using a mill which is formed from a master die made as shown in Fig. 4. For forming the die the pitch between successive positions of the punch is

represented by the letter "p". The path taken by the punch is shown by the chain line (21).

Fig. 5A shows a prior art roll having initially isolated square cells (13A) (dash-lines) on square matrix and cell walls (10A). With burnishing and wear smaller cells (13B) (continuous lines) are formed with a somewhat irregular outline. At the same time a significant "corner post" (17A) (as represented by arrows 23B) is built up at the cell walls which is a serious impediment to any ink flow.

In Fig. 5B another prior art arrangement is shown. In this figure the cells (13A) (dash-lines) are of approximately similar shape as in Fig. 5A initially and narrow shallow connecting channels (22) exist between adjacent cells in the direction (14) of the circumference of the roll so that ink can flow between cells. When these channels block with wear, to give cells (13B), a significant "corner post" (17A) is again created (as represented by arrows 23B).

In Fig. 6, the arrangement of the present invention, the initial cells (13) are shown as dash-lines and the cell shape with burnishing and wear is shown as cells (13B). Whilst the general burnishing and wear has occurred to the same extent as in Figs. 5A and 5B, the "corner post" (17A) (as represented by arrows 23B) is not so excessive and ink can flow easily across the corner post so that the quality of printing is not badly damaged.

(Note particularly the small distance between the vertical arrows 23B.)

In a typical design the width (W) of the wall areas is 16 microns; the cell (13) opening dimension, taken on the minor axis of the diamond-shape, is 140 microns with a maximum cell depth of 60 microns; and the weir (15) has a width dimension of 28 microns and a depth of 12 microns. The angle between the cell wall (as viewed in section) at the base of the cell is 99° and the greater angle between cell walls at the periphery of a cell is 110° . A cell dimension, as measured from weir to weir (i.e. cell pitch) is 160 microns and the extent of overlap of the cells is 40 microns. The lateral pitch between cell is 100 microns. Overlap preferably exists in the range of 15 to 25%.

For the dimensions above the linear count of cells would be approximately 78 per centimetre.

CLAIMS

1. A process of mechanically engraving a printing roll comprising the step of applying a forming tool to the roll surface in a manner such that sequential diamond-shaped indentations caused by the tool partially overlap taken in the direction of the circumference of the roll.
2. A process according to Claim 1 in which the cell is formed to have an elongated rhombus (diamond) outline with the major axis being in the direction of the circumference of the roll.
3. A process according to Claim 2 in which the cells have a whole or truncated pyramid form.
4. A process substantially as herein before described with reference to the drawings.
5. An engraved printing roll made according to the process of any preceding claim.
6. A mechanically engraved printing roll having cells defined by constant width zig-zags which are mirror images of each other but not touching so that the cells are interconnected, in the direction of the circumference of the roll, at sharply defined weirs.